



A CASE STUDY OF JUMPING FROM THE C-17 AND THE C-130:  
A BETTER PLATFORM FOR PARATROOPERS?

GRADUATE RESEARCH PROJECT

Cristian J.T. Simon, Captain, USA

AFIT/GMO/ENS/04-11

Approved for public release, distribution unlimited

The views expressed in this graduate research paper are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government

A CASE STUDY OF JUMPING FROM THE C-17 AND THE C-130:  
A BETTER PLATFORM FOR PARATROOPERS?

GRADUATE RESEARCH PROJECT

Presented to the Faculty of the Graduate School of Logistics  
And Acquisition Management of the Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Mobility

Cristian J.T. Simon, BA

CPT, USA

June 2004

Approved for public release, distribution unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

## **Abstract**

The unique nature of the relationship between the United States Army and the United States Air Force is never as visible as when Airborne operations take place. The United States has had a fighting force of paratroopers since World War II, and the Air Force has been a key enabler of this fearsome fighting force. The key to this synergistic relationship is the proper employment of aircraft, coupled with the right support to the warfighting paratrooper.

The C-130 has been supporting Airborne paratrooper forces for over 25 years, and has a proven record of success; Operations URGENT FURY, JUST CAUSE and most recently ENDURING FREEDOM have demonstrated that the airframe has continued to evolve and remains a viable platform for the insertions of paratroopers.

Since the C-17 has come into the USAF arsenal, it has made great progress in supporting Airborne operations. The C-17 has executed insertions of paratroopers over large distances. Most recently it was used for the insertion of the soldiers of the 173<sup>rd</sup> Airborne Brigade into Northern Iraq. Over 1,000 paratroopers were moved from Italy to Northern Iraq, providing both a military lodgement, but also making a very visible show of force to those who would oppose America and her Allies.

This research project is to perform exploratory analysis, hinging specifically on interviews conducted with members of the US Air Force community who have inserted paratroopers, and members of the community of US Army military parachutists who have exited the aircraft in question. The purpose of this research is to identify whether one airframe is superior to another for the insertion of Airborne soldiers.

## **Acknowledgments**

I wish to express special thanks to my Air Force Institute of Technology Advisor, Major Kirk Patterson, Ph.D., whose encouragement was crucial to the successful outcome of this research. Further thanks must be expressed to LtCol Arostegui, Ph.D., whose incisive comments and timely suggestions proved truly invaluable. Great appreciation is also due to my Military Advisor, Brigadier General Allardice, for his support of this course of study.

Particular thanks and praise is also to my peers and classmates who constantly offered unique perspectives; their collective wisdom allowed me to gain a much deeper appreciation not only of the individual airframes in the USAF inventory, but also the delicate balance of the various tactics and techniques for their ideal employment. Above all, I would like to thank my friends and family, who supported me through the completion of this project.

# Table of Contents

	Page
Abstract.....	iv
Acknowledgements.....	v
List of Figures .....	viii
I. Introduction .....	1
Background .....	1
Research Question .....	2
Scope of this project.....	3
Overview of Subsequent Chapters.....	4
II. Historical Background of Airborne Ops and the Acquisition of the C-17 .....	5
Literary Review and Precedents .....	5
Airborne Forces Come to Fruition: WWII.....	7
Refining the Paradigm for WWII Airborne Operations.....	11
The Normandy Invasion.....	14
Further Refinement.....	17
Between WWII and the Korean War.....	19
15 Years Later: Vietnam.....	23
The 1980s.....	26
First Steps: Operation BRIGHT STAR.....	36
III. Methodology .....	44
Qualitative Methodology Defined .....	43
Interviews in the C-130 Community .....	44
Interviews in the C-17 Community of Pilots.....	45
Interviews in the Community of Paratroopers.....	46
IV. Results of Interviews and Data / Proposals for further study .....	50
Advantages from the paratrooper perspective .....	51
Disadvantages from the paratrooper perspective.....	53
Advantages from the pilot perspective ... ..	57
Disadvantages from the pilot perspective .....	58
V. Conclusion and Recommendations.....	60

VI. Bibliography.....	64
VII. About the Author.....	67



## List of Figures

<u>Figure</u>	<u>Page</u>
Figure 1, Template of C-17 vs. C-5 MOG.....	29
Figure 2, Visual Meteorological Conditions Personnel Airdrop.....	40
Figure 3, Derived Maximum Descent Comparison.....	41
Figure 4, Adjusted Derived Max Descent Comparison.....	42
Figure 5, Historical Day and Night Injury Rates.....	43

THIS PAGE INTENTIONALLY LEFT BLANK

“... On Sunday, [SAMs] found their mark for the first time, with devastating results. One or possibly two missiles are believed to have hit one of two Chinooks that were carrying dozens of soldiers to the Baghdad airport. Sixteen troops were killed and 20 injured in the deadliest incident since the U.S. launched its invasion March 20.”

Excerpt from Los Angeles Times, 4 NOV 2003, Page 4, titled “Portable Missiles may rise as threat.”

## **Chapter One**

### **Introduction**

Almost as soon as men were flying, other men were trying to figure out how to jump out of airplanes. In the development of Airborne doctrine, nations that have boldly fused modern technology with the audacity of soldiers have developed infamously capable fighting forces. Changes to Airborne doctrine have historically been made only after significant accidents and/or incidents. With the convergence of technology and threats, current airdrop doctrine flaws are open to exploitation by enemy combatants. If newly recognized operational capabilities are not fused to an equally new doctrinal shift in both tactical and technical employment, the probability of exploitation of doctrinal weaknesses increases. One of the most recent acquisitions within the arsenal of the United States of America is the C-17 Globemaster. It has recently been used as an insertion platform for Airborne operations, most notably in the airdrop of the 173<sup>rd</sup> Airborne Brigade into Northern Iraq.

Fully introduced in the 1990's, the C-17 is beginning to be fully exploited as a platform for the insertion of Airborne forces. Beginning with Operation CENTRASBAT

'97, then subsequently in Operation JOINT ENDEAVOR in Bosnia, followed most recently by its use in Operations ENDURING FREEDOM and IRAQI FREEDOM, the C-17 has established itself as a highly effective airframe. The C-17 carries loads that could previously only be carried by the C-5 aircraft, and delivers them to airfields previously accessible only to C-130-series aircraft. It has effectively blurred the lines between tactical and strategic airlift. (Shanahan, 2002)

In the last 20 years, the USAF has been able to attain air-to-air supremacy. The main threat remaining toward airdrop aircraft is increasingly effective surface-to-air missiles (SAMs) and man-portable anti-aircraft surface to air missiles (MANPADs). These are available at low cost, having been mass-produced and distributed by both the former U.S.S.R, and the People's Republic of China. The comparatively low cost of man-portable surface-to-air missiles coupled with their ready availability emphasizes the need to ensure joint airborne operations training is done in a timely manner and incorporates the most recent tactics, techniques and procedures, using optimal equipment.

GEN Schoomaker, Army Chief of Staff, publicly predicted an increased need for and projected use of SOF (Special Operations Forces) and Airborne troops at the Airlift Tanker Association convention in the fall of 2003 (Schoomaker, 2003.) This growth is slated to occur at the same time that the United States is retiring the C-141 Starlifter fleet, when the median age of the C-130 fleet is over 25 years, according to the USAF information website ([www.af.mil](http://www.af.mil), 2004). This median age even takes into account the C-130 fleet avionics modernization program, which was initiated in 2001.

The evolving threats against airdrop platforms may lend themselves to an expanded use of the C-17 as a platform for the insertion of airborne forces and airdrop of

equipment. One of these is the ability to conduct High-Low Tactical Airborne Insertion (HLTI.) In a HLTI, the aircraft fly at heights in excess of 32,000 feet AGL, and in a short timeframe, descend to a height and speed that is adequate for the insertion of airborne troops, and then rapidly climb back to 30,000+ feet. The effect of this maneuver is that it reduces the amount of time that the aircraft is left exposed to SAMs.

This method of insertion was used to insert the 173d Airborne into Northern Iraq, and was described in the after actions-review (AAR) by the US Air Force as “the way we will do business in the future.” (O’Neill, 2003) Currently, however, the number of airborne personnel who have received the training required to jump under the special conditions presented through the use of HLTI is limited. Also, HLTI is viewed as a technique within the USAF C-17 community, and is not trained separately from other skills. The HLTI tactical maneuver is not ideal in all situations, but provides an example of a technique that has only recently been developed.

There is a crucial need for exploitation of capabilities unique to the C-17, while balancing its strengths with other airframes already in use in the USAF fleet. Can the C-17 effectively assume all of the tactical insertion of airborne troops, a mission which is currently also being performed by other tactical airlift airframes? Is it optimal and/or preferred as an airframe for the insertion of paratroopers? To determine whether or not it can, this paper will examine the historical roots of Airborne doctrine, from WWI to the present; examining specifically the development and subsequent employment of the C-17 in the years since its initial fielding. Finally, we will examine some of the pitfalls and shortcomings of over-utilization of the C-17, and compare it with other airborne insertion

platforms, specifically the C-130, and its variants the MC-130 E/H Combat Talon I/II and the C-130-J-30.

Technologies available during the early years of the Airborne dictated the doctrine that defined the employment by which aircraft deployed paratroopers and cargo. As technology has changed, training and doctrine regarding the means of employment of aircraft, and their relationship to soldiers must change. Accordingly, if one type of airframe is clearly superior to another for the insertion of airborne forces, that airframe should become the airframe of choice.

## **Chapter 2**

### **Literature Review and Historical Precedents**

Towards the end of WWI, the German stronghold at Metz, in France, was proving almost impervious to the best efforts put forth by GEN John J. Pershing. His head of operations, COL “Billy” Mitchell, had a plan:

Mitchell’s concept called for 12,000 parachutists, each with two machine guns, to drop from 1,200 bombers, creating havoc in the enemy’s rear and an opening for the Allied advance. [...] Mitchell put his new operations officer, MAJ Lewis H. Brereton, to work on the project but the armistice stopped his study. The Allies would not test the idea for many years to come. (Galvin, 1969: 2-3)

World War I was thought of as “The War to End All Wars,” and it was assumed that there was little chance that as deadly a conflict would be fought again. For this reason, the United States greatly scaled back its military and pursued a policy of disengagement. The concept of training a force of soldiers jumping out of airplanes had become neither relevant nor financially tenable in the United States of America. It is for this reason that the United States accomplished only limited airborne testing between WWI and WWII.

Other nations, who would ultimately fall into adversarial relationships with the United States and her Allies, were keenly interested in the potential tactical gains that could be gained using new technologies, and spent the inter-war years developing it. The two Nations that were proponents of Airborne troops were the Union of Soviet Socialist Republics and Germany. The USSR was quite open about its planning and training regimen, even going so far as to send film footage showing a Battalion-sized force executing an airborne maneuver in 1935 (Hickey, 1979: 15).

German strategists were also quick to see the tactical benefits of shock and surprise that would be gained by an airborne insertion. It is with this understanding that German strategists anticipated a need for airborne soldiers during the annexation of the Sudetenland; it was thought that they would be employed in Czechoslovakia. However, inaction on the part of the West precluded the need to employ airborne forces. It is for this reason that the true effectiveness of German Airborne operations would not be displayed until some years later. The Nazis made use of the time given to them through the inaction of the West to refine their tactics, techniques and procedures for the employment of paratroopers.



## **Chapter 2.1**

### **Airborne Forces come to fruition: The Second World War**

In launching the attacks that began the War that Germans refined and codified the airborne tactical concepts that have existed up until the present day. Owing to the long distances to objectives in both mid and northern Norway, it was key to the success of the German operations to seize Danish airfields on the first day of their offensive operations. The airborne plan was to be sudden and equally violent. “Just as victims of smash-and-grab raids are paralyzed by the violence of the onslaught, so did the Germans visualize the effect of their airborne arrival.” (Hickley, 1979; 43-44).

The airborne portion of the assault was considered a success, but many problems were identified which needed to be solved in order to improve future operations. Among these were command and control of the force while they were en route to the target, a lack of heavy weapons in support of the parachute assault, and the inability of troops to jump with any but the lightest small arms. (Hickey, 1979: 46). However, though identified, these problems were not resolved before the Germans attempted an action that solidified the importance of airborne operations – the invasion of Crete.

German paratroopers attacked the island of Crete on 20 May, 1941. Although German intelligence preparation of the battlefield was inaccurate, and the dug-in force of British and New Zealanders fought well, the British were stymied by the overwhelming air superiority the Germans had been able to establish. British forces were rendered combat-ineffective and summarily routed from the island in less than 2 weeks.

In spite of the fact that the Germans repeated many of the same mistakes in their invasion of Crete as they did during their earlier attacks in Denmark and Norway (lack of command and control, only light weapons available,) it was considered a significant victory for the Luftwaffe. “It was the only victory won by any of the contestants of the Second World War with the sole use of airborne forces... The moral effect of the combination of close air support and shock tactics had not only secured a major strategic victory for the Axis, but had further spread the myth of invincibility with which the German airborne were now endowed.” (Hickey, 1979: 72).

The ‘significant victory’ came at a price; in excess of 11,000 soldiers were killed or wounded, which translated to an effective 44% casualty rate, and 170 out of 530 aircraft destroyed. The staggering losses would cause Hitler to shy away from further airborne operations, so much so that he felt that casualties incurred in any large-scale airborne operations would be unacceptable. It is thought that German military planners felt that the Allied forces would be aware of the high cost of the victories, and come to the same conclusion regarding the employment of airborne forces. They were mistaken in their conclusions. The speed with which Axis victories were accomplished, and not their cost, drove the British and the Americans to spur on the development of their own airborne forces in 1940. Ironically, then, just as the Germans were beginning to dismantle their airborne operations, the Allies were seeking to develop their own.

In the United States, the War Department organized its first Airborne force, the 501<sup>st</sup> Parachute Company, at Fort Benning, Georgia, in July of 1940 (Miller, 1988: 79). The unit soon would be expanded to a battalion-sized element, but it was not until November 1941 that the Air Corps first dropped more than one Company of paratroopers

(Warren, 1955; 1) By February of 1942, the parachute group had grown to four Battalions. The next step would be the expansion to Division-sized units. “From the outset [the planners] were set on a small, ‘greatly stripped-down’ division of about eighty-three hundred men, about half the number in a normal infantry division... Such a division (sic) would have one parachute regiment of about two thousand men, and two glider regiments of about sixteen hundred men each, plus light infantry and supporting units. The parachutists would land first, [seizing] an airfield into which the gliders would land” (Blair, 1985: 32). This mirrors current airborne doctrine, in which an assault force (typically U.S. Army Rangers) is trained to seize an airfield for follow-on operations.

As part of OPERATION TORCH, the Allies attempted their first major airborne operations of WWII. TORCH was an amphibious landing in Northwest Africa. The speed and element of surprise that would be bought through the use of airborne forces was an integral part of the TORCH plan, which called for a quick seizure of Algeria, followed by a rapid crossing over to Tunisia in order to defeat Field Marshall Rommel.

The Airborne forces moved over 1,500 miles from England to Algeria (Miller, 1988; 82). This may well have been the first truly “strategic” airdrop, defining it as the movement of troops from one theater of war to another for the purpose of conducting immediate combat operations. The results were less than optimal.

Considering the operational difficulties of just arriving in the general area of the target, the mission was a good proving ground for how not to conduct an airborne assault. About half the flight was over Spain, a neutral country somewhat friendly to the enemy. Navigators had only limited celestial navigation training and were somewhat unfamiliar with their British equipment. Due to a combination of bad piloting and bad luck, the formation lost contact with many of its elements during the flight. The flight was made at night – at 10,000 feet, in the clouds – which made the ground references useless. Fourteen of the pilots were assigned planes at the last minute, departing England with minimal rest and

briefings. Only one-tenth of the airplanes had adequate charts. The flight failed to receive signals from two clandestine radio beacons near Oran... of the 39 C-47s that left England on 7 November only 14 were serviceable a day later; 9 were missing, 3 destroyed, and 13 damaged. (Miller, 1988: 82)

On the ground, the results were worse. Disoriented and unsure of their position, some troops dropped near a column of “Vichy French” tanks fired upon them, only to subsequently find out that they were actually American tanks headed toward the battle at Oran. Others, while attempting to land at an airfield under Allied control, were fired upon by Allied airplanes that had not been given the appropriate information ahead of time. The soldiers that made it through encountered light resistance. This was arguably for the best, since the airborne forces were unable to effectively mass on their assigned objectives.

While nobody could reasonably claim victory as a result of the operation, it had demonstrated a potential ability to effectively deliver large numbers of troops over substantial distances in order to mass combat firepower at a location of our choice. Not surprisingly, there were still many who criticized the use of airborne operations.

There was a strong body of opinion, which, whilst acknowledging the value of small-scale airborne raids... strenuously opposed any attempt to mount operations on a brigade or divisional basis. The airborne school countered that the forthcoming raid into Europe called for large-scale parachute and glider landings in order to confuse the defense, cut lines of reinforcement, paralyze the Axis command system and secure the flanks of a seaborne assault (Hickey, 1979: 97)

Soon enough, however, the advocates of airborne operations would have the opportunity to prove their worth, integrating lessons learned into planning and execution of future operations.

## **Chapter 2.2**

### **Refining the paradigm for WWII Airborne Operations**

OPERATIONS HUSKY and LADBROKE were the first large-scale Allied airborne operations of WWII. On the surface, the results of these operations appeared completely disastrous; everything that could go wrong, seemed to. The American portion of the mission, Operation HUSKY, involved the airdrop of the 82<sup>nd</sup> Airborne, using 226 C-47 transports. Whereas the primary architect for the plan was optimistic that it would be a success, it was far from it.

For safety, it was decided that the drop would be done at night, and almost all lights on the planes were extinguished. With minimal moonlight, coupled with salt spray at lower altitudes, visibility was greatly diminished. The difficulties were compounded by a 35-mile-per-hour crosswind, which caused relatively inexperienced pilots to land far from their designated landing strips. Finally, preinvasion bombardments created dust and smoke, which obscured landmarks. The end result was that paratroopers were scattered for 60 miles along the coast of Sicily.

The British portion of the operation fared worse, with a ludicrously dangerous night glider landing force by British pilots under-trained in flying U.S. gliders. The mission proceeded in spite of this; in the end, only 11% of the (12 of 137) gliders eventually reached their landing zones. 65 gliders were lost at sea, killing over 600 men (Boston, 1983: 67). In total, 25% (60 of 237) of the aircraft were either damaged or destroyed by friendly fire (Boston, 1983: 67).

Amazingly, not all the results of the operation were negative; due to the—unintentionally—widespread locations of the American troops, and the eager attitude with which they prosecuted their side of the fight, the Italians and Germans thought there were many more airborne troops on the island than there actually were. In addition, they were unable to determine what the actual allied objective was. It was even expressed by a senior German airborne expert that the presence of the Allied airborne forces effectively prevented one of two German divisions from reinforcing the Axis positions, which led, in turn to the Axis defeat in Sicily (Miller, 1988: 88.)

Furthermore, the operations provided more insight into necessary changes, as well as further refinement of the means of employment of airborne forces, which would prove invaluable later in WWII. The Allies began to develop small teams of Pathfinders, and equipped them with marker panels, radio beacons and lights in order to mark the drop zones ahead of time.

Another contributing factor in the prosecution of the Operation was that staff officers with no troop carrier or airborne experience had planned it. Also, troop carrier leaders quietly acquiesced because they either had no better proposal or misunderstood the difficulties involved. Experiences in Sicily emphasized the need for a joint airborne planning headquarters subordinate to an Air Force commander and responsible for the entire operation until the troops reached the ground. It was determined that the key to airborne warfare lay in concentrating troops and firepower on the ground, a function of thorough planning and proficient troop carriers. These lessons became the doctrinal basis for airborne operations in the invasion of Europe. (Boston, 1983: 68).

The technology that would be used to make airborne forces lethally effective predated their tactical employment. It was only through tactical missteps and loss of life that the need for leveraging technology and doctrine with audacity was made apparent. In a short matter of time, using the lessons that had been learned at a heavy cost, the planners and war fighters would combine the three to great effect.

## Chapter 2.3

### The Normandy Invasion

As the plan for the invasion of Europe was being finalized, the nascent airborne community was busy formulating doctrine based on experience. Italian operations validated the newly incorporated concept of Pathfinder teams; sent forward into the DZ (drop zone) before the main force, they greatly enhanced the probability of success in missions. Also, two other important tactical abilities that use of airborne forces possessed were focused on during domestic training exercises, to change Eisenhower's mind about the efficacy of airborne operations, of which he was skeptical. Those principles were finally outlined in a document entitled *Employment of Airborne and Troop Carrier Forces*.

Routes, altitudes, time schedules, and means of identification, both while in the air and on the ground, must be known in advance by all concerned. Procedures must be prescribed which will ensure that troop carrier aircraft which are on course, at proper altitudes, and on the correct time schedules, are not fired upon by friendly land, sea, or air forces. [...] Airborne units should remain under the direct control of the theater commander until they land in the ground combat area when control passes to the commander in the area. (War Department Training Circular No. 113, 1943).

Two other important facets of airborne operations were noted in the circular, but were not recognized at the time as being principles of airborne operations. The first was the idea that troops should be deployed en masse. The second was the fact that air superiority was a fundamental prerequisite for an airborne operation to have any real chance of success. Because of the low, slow approaches flown, and the lack of any defenses for the troop carrier aircraft, any airborne attack would have to be invulnerable from above. These



principles were crucial in planning the airborne invasion of Normandy, in what was eventually called Operation NEPTUNE.

The NEPTUNE plan was for two American divisions, the 82<sup>nd</sup> and the 101<sup>st</sup>, to drop near Ste. Mere-Église. Their purpose was not only to hold the town, but also to prevent any German reserves from reinforcing the Axis defenses on Utah Beach. On June 6<sup>th</sup>, 821 C-47s and over 100 gliders carrying over 13,000 men and their equipment took off from airfields in southern England. The Pathfinders were in the lead, by roughly half an hour, followed by the 101<sup>st</sup> and then the 82<sup>nd</sup>.

The formation went well until they reached the coast of France. The planes encountered a weather front that reduced their visibility, causing the formations to split apart due to their inability to see each other. Also, due to the order of maintaining strict radio silence, the first planes were unable to warn the planes that were following them of the problems they were encountering. Further complicating matters, only 40% of the planes had been manned with navigators to find the drop zone.

In spite of these difficulties, over 13,000 airborne troops parachuted into Normandy; of these, only 10% landed on their drop zone, but 60% landed within 2 miles of their drop zones. The gliders had similar problems, with only half of them effectively delivering their personnel (Boston, 1983: 69). In spite of the shortcomings of the operation, the objectives of the airborne force were accomplished. Ste. Mere-Église was captured and Axis reserves never effectively reinforced Utah Beach. By their allowing the Allies the means to establish a critical beachhead, airborne concepts soon grew into an important consideration for future Allied plans.

The Normandy landings completely vindicated the concept of employing the parachute and glider troops in Division size and Eisenhower's insistence on massing them on critical objectives within quick linkup distance of other friendly ground forces. This refusal to consider using the paratroopers as small harassing forces and his equally adamant stand against deep airborne raids were important factors in the success of D-Day. At the same time, the Allied staff proved quite capable of planning a large-scale air-assault and integrating it into the overall tactical scheme. (Galvin, 1969: 155).

The lessons learned and validation of doctrine that was gained from NEPTUNE were thus codified:

- Large-scale, Division-size, airborne operations are possible.
  - Night airborne operations – parachute and glider – are possible, but daylight operations are much preferred for accuracy.
  - Air superiority contributes immeasurably to successful airborne operations.
  - Effective communication between the airborne forces in the field and the troop carrier forces is a must.
  - Bad weather can have a serious impact on an airborne operation.
- (Miller, 1988: 102-103).

It is a fair assessment to state that many of the principles developed and hammered out in Operation NEPTUNE remain true to this day. The requirement for daylight operations has changed, however. With advances in technology, we are now able to operate in total darkness, gaining a tactical and psychological advantage over enemy forces.

## **Chapter 2.4**

### **Further refinement of Airborne doctrine through the end of WWII**

Allied Airborne forces would be used again in Europe, but two operations contrasted in their success; operations MARKET and VARSITY, both the largest and the last use of paratroopers in WWII, respectively. To some, it seemed that lessons learned in previous operations were proven true in Varsity, but only after being relearned in MARKET. In OPERATION MARKET GARDEN over 35,000 men either parachuted from or rode gliders. Because of the sheer number of troops involved, missions were spread over three days. This effectively made it impossible to get the men on the drop zone in mass and in a timely manner. The lessons learned in this operation and its predecessors would finally come to fruition in the last major airborne assault of the war – Operation VARSITY, the airborne assault across the Rhine.

The operation was designed to take the high ground on the east of the river and protect an amphibious assault coming across the river. The plan was for a daylight assault launched from ten drop zones, the majority of which were located close to one another. Over 17,000 troops along with ammunition and equipment were to be dropped in 4 hours, and they were to receive immediate resupply by air. “Finally, the Allies were learning to concentrate in mass for an overwhelming assault in a short period of time, taking advantage of the element of surprise (Blair, 1985: 453-457.)” Rapid massing of combat power using an Airborne Forces played a major role in the Allied breakthrough into Northern Germany. General Lewis Brereton, the Commander of the Airborne force

in Operation MARKET, pointed out the factors that led to the ultimate failure of his plan (and conversely, the success of VARSITY) in his AAR (After Action Review.)

“Concentrate the maximum force on the principle objective.” This sounds trite, but the ground force planners persist in presenting a multitude of objectives. An all-out effort with everything that can fly must take advantage of the initial surprise by dropping the maximum of supplies before the enemy can muster his air, flak and ground defenses. All troops and landing from the outset must be in combat teams, no matter how small the combat team is. By this I mean that you cannot count on landing your parachutists today hoping to land their heavy weapons and transport in a landing lift today or tomorrow. Every serial launched must be reasonably capable of sustaining combat, even if a combat team is no larger than a company. (Miller, 1988: 115).

General Brereton was making a case that has not changed greatly over the years since then. Effectively, he was calling for a maximum-sized force on the ground with maximum possible firepower in a minimum time. This allows the Airborne forces their best chance to achieve their objective, while ensuring that the objective is not so widely dispersed as to minimize the effects of the forces that have been inserted. Modern Airborne doctrine has codified this principle, in that the follow-on forces are a crucial part of the entire operation. The mission does not end when the last paratrooper exits the plane; it ends when the airhead has been captured, and the last of the follow-on forces have “boots on the ground” in the combat zone.

## **Chapter 2.5**

### **Between WWII and the Korean War**

With the end of WWII, the newly formed Air Force needed to determine what role it would fill as a service. This identity crisis was of particular relevance to the proponents of Airborne operations, as the Air Force had developed a distinction between strategic and tactical airlift; the Air Transport Command and the Troop Carrier Command, respectively. Major General Paul Williams, a former troop carrier commander, proposed a paradigm shift in how the Air Force should view air transportation issues.

Arguing that long-range troop carrier aircraft were capable of transporting entire ground force units over thousands of miles into combat, he said that the whole premise of the Air Transport Command's responsibility for inter-theater airlift was no longer valid. Distances involved and equipment utilized could no longer be the criteria for distinguishing between troop carriers and strategic airlift missions. Instead, General Williams wanted troop carriers to be responsible for air transportation of units into combat regardless of the distances involved. Air Transport Command, on the other hand, would be in charge of moving individuals and miscellaneous cargo, again regardless of distance... To the extent that airlift could deliver integral combat forces across long distances directly into combat, it should have that mission. It saved time and had great strategic potential. (Miller, 1988: 206-207)

The Commanding General of the Army Air Forces believed that the strategic mission should remain separate from that of the theater forces; ultimately, his perspective was supported. While the next twenty plus years would see the argument raised repeatedly, the 'battle-tested' methods that had been used (and doctrine that was established) in WWII were carried on by default.

The Army was intent on proving the continued need for airborne operations and enhancing that capability; having gained insight and a fresh perspective on the difficulty

of ‘playing catch-up’ with enemy capabilities, they were intent on remaining proactive and innovative in tactics and policy. During the Berlin airlift in 1948-49, the troop carrier aircraft were conscripted into the air land operations of Operation VITTLES.

As a result of OPERATION VITTLES, it was perceived that “interest in troop carrier activities [waned] as airlift came to be seen in terms of ton-miles hauls and firm scheduling – the doctrinal legacy of the Berlin airlift.” (Warren, 1957: 8). For this reason, General Brereton scheduled an exercise in early 1950 to show the capacity of the troop carriers and the airborne divisions. The intent of this exercise was to demonstrate the airborne force’s ability “maintain and operate an airhead wholly within enemy territory. It was to be the first tactical application of the strategic airlift technique to be attempted under simulated combat conditions.” (Miller, 1988: 190).

Sixty-nine aircraft delivered 1,900 paratroopers to the drop zones, and within four hours this force had the airhead ready for operations that brought in 68 more aircraft, landing and delivering over 2,000 more troops and equipment. When the operation was complete, 5,606 paratroopers and 365 tons of equipment had been dropped, with 8,753 passengers and 2,500 tons of equipment delivered at the airhead. (Miller, 1988: 191-192). In spite of the impressively large numbers of troops and materiel, technology had not been leveraged to offset and/or avoid some of the same problems that had been identified in WWII. Chief among the issues were the need for absolute air superiority and a shortage of transport-type aircraft.

One of the maneuver commanders was quoted as saying, “There will always be a shortage of transport type aircraft and we cannot carry out an expansion of our air transport force until we are sure we have done everything we can to maximize the

utilization of what we already have.” (Miller, 1988: 194). Some might find a certain irony in the fact that the constraints of the 50’s so closely mirror those of our ‘modern’ era, and that the acquisition of the C-17 is proceeding at a measured pace.

Only two actual airborne operations occurred during the Korean War. The operations (in 1950 and, later, in 1951,) were notable not so much for their tactical value as for the flawless execution of techniques that had been perfected since WWII. The other notable result of both of the operations was the fact that the Airborne troops ultimately arrived too late to effectively destroy their targets. In both operations, approximately 3,500 men were parachuted in, as well as over 50 tons of ammunition and supplies, along with several vehicles and large guns. “The drop went down with copy-book precision and the aircraft returned for a second and third lift... It was a staggering display of the advances in airborne techniques since 1945, and it was the first time that such quantities of heavy support weapons and vehicles had been parachuted in one operation.” (Weeks, 1978: 170-171). The fact that both operations failed to accomplish their stated objectives, however, pointed to a need to refine the planning process and execution of Airborne operations. A fighting force, which had perfect execution of its mission ‘too late in the fight’, was not able to gain significant advantage.

In spite of the shortcomings of the operations, some doctrinal shifts did result; an unrelenting need for airdropping and airlifting supplies to isolated units led to a change in command and control policies. In order to effectively accomplish airdrop and airlift, it became apparent to the commanders that all airlift assets in the theater should be consolidated under control of a central agent, who would then answer to the theater commander. Owing to the combination of a shortage of transport-type airplanes, and the

increasingly dynamic use of Air Force airframes, “No longer could the Air Force afford the luxury of airlift organically assigned to airborne units and not used to maximum advantage.” (Boston, 1983: 73). With the signing of the armistice that put the Korean War on a ‘low simmer,’ and up until the late 1960s, airlift’s primary issue would now be focused on the separation between theater airlift and its counterpart, strategic lift. The C-17 would ultimately bridge this gap.



## **Chapter 2.6**

### **Fifteen years later: Vietnam**

As technology began to enable the jet age, the Air Force began to move toward larger aircraft with a capability of flying further. Airborne operations would eventually adjust themselves to the technology that became available to them. Secretary of State Robert McNamara, in a public commentary that proved very prescient, was quoted as saying:

The distinction between troop carrier and strategic airlift operations based upon differences in equipment will no longer be significant once the C-130Es and C-141s are acquired. Both of these aircraft are suitable for either mission. [...] Indeed, the C-141 may open up entirely new vistas in troop carrier operations. For example, it might prove entirely feasible to load troops and their equipment in the United States and then fly them directly to the battle area overseas, instead of moving them by strategic airlift to an overseas assembly point and then loading them and their equipment on troop carriers. Thus, the line of demarcation between the strategic airlift mission and the troop carrier or air assault mission may, in time, become less important. (Miller, 1988: 283-284).

Not long after his public comments, in the winter of 1965, the Air Force moved entire Army units first from Hawaii to Pleiku, Vietnam. Bolstered by the success of this movement, the Air Force then flew Army units all the way from Ft. Campbell, Kentucky, to Bien Hoa Air Base, Vietnam, in November of 1967 (Miller, 1988: 334). These movements proved the ability of strategic transport aircraft to deliver directly from home base to the combat arena. While these missions air landed the troops and equipment (the planes actually landed and offloaded, versus dropping the paratroopers as they flew over,) they indicated the feasibility of airdropping from strategic distances as well.

During Vietnam, the United States Army sought to do everything it could to maintain its own organic airlift forces. The conflict provided the genesis for the new

concept of air assault, or airborne cavalry forces, and an optimal area for their employment. Taking advantage of the operational flexibility helicopters provided, forces were rapidly flown in or out of landing zones. The Army forces could also either land or be inserted using rappelling techniques. Attack helicopters provided the close air support and heavy lift helicopters transported the troops; as a result of these operations, the Army was able to make a valid case for not only sustaining but also increasing their organic air mobility assets.

As the Army was determined to reduce its reliance on the Air Force, the majority of troops tactically deployed into combat zones during the Vietnam War were dropped using rotary-wing aircraft. These provided the Army with additional speed and operational flexibility when moving troops around the battlefield, but remained relatively insignificant in comparison to the range or amount of equipment that could be moved using fixed-wing aircraft. Air Force planes provided an operational reach that was beginning to be able to effectively deploy troops across oceans. It would only be a matter of a few years before technology enabled intercontinental strategic deployment.

As the capabilities of the C-141 airframe were fully demonstrated and began to receive more attention as a war fighting option, the concept of airdropping a brigade into a combat zone thousands of miles from the port of embarkation was being looked at as a doctrinal concept. Towards the end of the Vietnam War, General Paul Carlton, commander of the Military Airlift Command, was asked how far forward in the combat environment the C-5 and the C-141 would operate. His response remains as valid as it was then:

It depends on how much carrying the freight to that point is worth to the JCS or the operation that is going on. We have already used the C-5 both in Saigon and Da-Nang, in Vietnam, in very high-risk zones. We have operated under the threat of SAM, of the surface-to-air, as well as air-to-air, under very unusual circumstances such as the second Tet offensive when we hauled tanks into Da-Nang. We don't expose ourselves unless the risk is worth it. We treat it carefully and conservatively, but to answer your question, if the risk is worth taking to win the battle, we will take it. Just like we will with any airplane... The JCS makes the decision... under almost all circumstances of risks. (Miller, 1988: 356).

The operations and doctrine that evolved from WWI up until the late 1970s were largely a function of building upon previous doctrine. The next twenty years would see technological innovation combine with innovative thinking to create an effective fusion of doctrine and Airborne insertion platforms at an unprecedented rate. This fusion would occur with the explicit understanding that risk, airframe capabilities, and operational employment would always be balanced with mission requirements. To understand not only how this has been made possible, but also why it is essential that it continue, we will look at the design, selection, and evolution of the C-17 as the newest cargo aircraft in the Air Force and how it has provided exceptional opportunities for employment of Airborne forces.

## **Chapter 2.7**

### **The 1980s**

In the 1980s, the requirement for a new airlift platform to replace the C-141 became increasingly pressing, as the first airframe had been delivered to the USAF in 1964. The airframes that the Air Force had in its inventory were effective in their separate capacities, but had very little crossover in their abilities. The C-5, for instance, had, and still maintains the capability to handle heavy and outsized cargo, but is unable to land at austere airstrips. Conversely, the C-130 had the ability to land at austere airstrips, but lacked the capability to carry outsize and/or heavy cargo. The capability to meet evolving airdrop requirements was one of the considerations for what would eventually become the C-17. “To assure the aircraft becomes the efficient workhorse that America needs, certain [...] characteristics have been specified. One of these is the requirement that C-X [the precursor to the C-17] be able to airdrop troops and equipment... This capability will provide the Army with the operational flexibility to insert or resupply sources wherever and whenever needed to influence a combat or contingency operation.” (Pilsch, 1981: 14).

Planners determined that certain situations might still call for an airborne assault force. “An airborne assault against an unsophisticated enemy in a limited war scenario remains a powerful weapon. To this end, the Army retains one airborne division, and MAC units maintain proficiency in methods to airdrop forces. The tactics have changed since WWII to match changes on the battlefield, but the doctrine that evolved remains intact.” (Boston, 1983: 75). Combining the ability to land in austere environments with

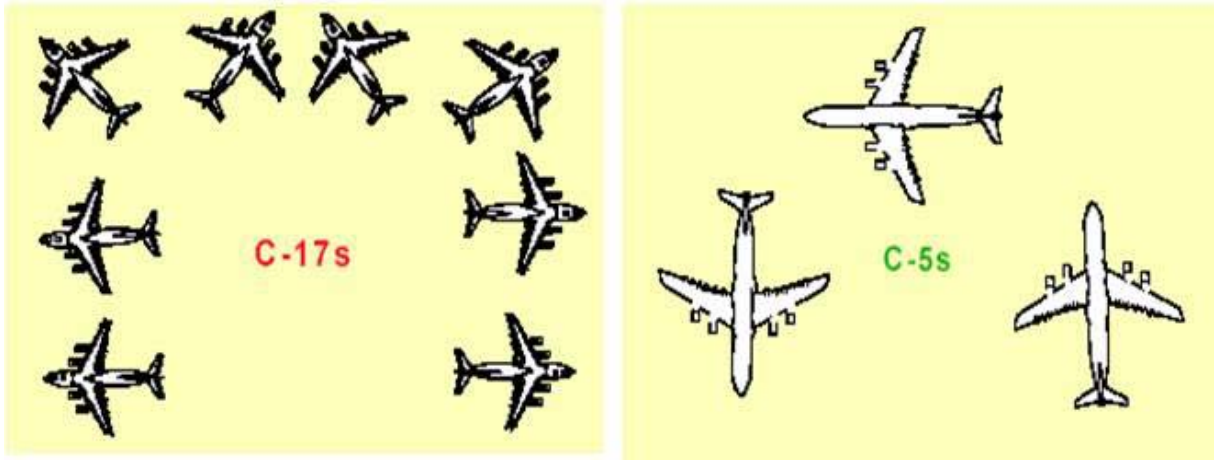
the ability to carry heavy and/or outsize loads, the new airframe would provide greater operational flexibility for the services.

The Carter administration formally initiated the C-X program as follow-on to the C-5 and the C-141. (Ulsamer, 1980: 16). Shortly after the C-X's initiation, a debate developed concerning this new airlifter; at the center of the new debate was the ability to deliver men and equipment quickly to any point in the world. "It [airlift] is much more than a transportation mode – it is an instrument of policy and a war fighting tool... The ability to air land or airdrop forces and equipment across long distances is a matter of hours gives civilian leaders and military planners a flexibility not found elsewhere. These capabilities also complicate planning by potential adversaries and can give them serious pause." (Miller, 1988: 370). The new airframe, by combining the capabilities of the C-5, C-141 and C-130 airframes, were viewed as significantly more important than simple airlift assets.

Even more so than in the case of the C-5 and the C-141, the next generation airlifter (the C-X) was designed in such a manner as to enable it to be used to leverage American foreign policy. Then Secretary of Defense Caspar Weinberger noted in his 1985 annual report to Congress, "For deterrence to be effective, we must be capable – and be seen as being capable – of responding promptly to aggression, with forces of sufficient size and strength to limit the extent of the conflict and protect the security of our friends and allies. A credible deterrent, then, hinges to a large extent on our ability to deliver forces rapidly to distant trouble spots and to sustain them once they are employed" (Department of Defense, 1984: 173).

The key to this capability was the ability to deliver forces directly to the battlefield through the use of small, austere airfields (SAFs). “The basic philosophy was that operating into SAFs improved force deployment and employment flexibility, enhanced the aircraft flow by decreasing ground lines of communication requirements, closed combat forces on time and at the right place, and complicated enemy interdiction efforts” (Miller, 1988: 390). One potential benefit of landing at SAFs was that there would be reduced conflict with local forces for ramp space. In fact, if the United States were to be able to move forces and equipment into a theater of operations opening airbases usable only by organic forces, competition for ramp space would be an issue of greatly diminished relevance.

Other aircraft were weighed against the acquisition of what would eventually become the C-17; the C-5 or the B-747 freighter. The B-747 could not handle the outsize cargo loads of the C-5 or the C-17, required substantial infrastructure of the type that is usually only found at a major terminal, and could not operate into SAFs at all. The C-5 could handle the outsize cargo requirements, but had difficulty operating into SAFs; since it (the C-5) could not back up, it required nearly three times more ramp space than that which would be required by the C-17 (see figure 1.)



(Figure 1, Template of C-17 MOG vs. C-5 MOG comparison, (Shanahan, 2002))

Essentially, the Air Force was looking for a single airplane that could handle nearly all the potential airlift missions in almost any environment. “The C-X request for proposal required an aircraft that could deliver a full range of combat equipment over intercontinental distances; operate through a 3,000-foot runway environment; airdrop troops and equipment; have ground maneuverability characteristics that would permit routine operations through small, austere airfields; be designed for survivability; have excellent reliability, maintainability and availability; and have a low life-cycle cost” (Miller, 1988: 396). The C-X met these requirements much better than any of its contemporaries would have.

Approval for the program proceeded in a limited fashion due to concerns brought forward by the C-17’s commercial-sector competitor, the Non-Developmental Airlift Aircraft (NDAA). The NDAA would be an off-the-shelf commercial freighter. “As a result of a 1993 Defense Acquisition Board review, the Deputy Secretary of Defense reduced the program to 40 aircraft for a provisional period, pending another Board to review in November 1995” (Airlift Requirements, 1994: 3). This review would focus on

the C-17s initial Reliability, Maintainability, and Availability Evaluation (RM&AE), which was scheduled for the summer of 1995.

Randy Harrison, a Boeing spokesman and proponent for the NDAA, stated “while the NDAA does not have all the features of the C-17, it can carry twice the cargo at twice the range, and at lower cost. Had it been used in Desert Shield... it [the NDAA] could have flown non-stop from the American east coast to Riyadh” (Fruehling, 1995: 37). The NDAA brought less of the desired capability to the force for less total expense. C-17 backers focused more on the military utility of the C-17, which was most evident through its direct delivery capability. The Commander of the AMC, General Robert Rutherford, effectively stated his reasoning for supporting the C-17 vs. the NDAA, saying “...the NDAA is a capable airplane, but it doesn’t have the capabilities of the C-17. It doesn’t have the airdrop, or short takeoff and landing; it is a much bigger airplane” (Fruehling, 1995: 39)

To be sure, technical, tactical and political considerations were factors in the decision to proceed with the procurement of the C-17. For our purposes, it is more important to note that the purchase of the C-17 was one of a number of decisions made which have allowed the Armed Forces different means and methods in which to employ Airborne forces. The C-17 was not by any means the only reason that the manner of employment of airborne forces changed (which is evident as the C-17 is not the only airlift support for Airborne forces,) but it was very much an enabler of changes that had started to occur.

Near the time the C-17 purchase was approved, the Goldwater-Nichols Reorganization Act of 1986 had greatly increased the power of the Joint Chiefs of Staff



and the Joint Staff. Additionally, the collapse of the Soviet Union led to a change in thinking from forward presence to forward projection of forces. With a decrease in the number of soldiers deployed overseas, we had to increase our ability to project forces anywhere on the globe. Airlift, most especially with the range, carrying capacity, and ability to penetrate austere airfields of the C-17, would provide the United States with the ability to bring force to bear at a place and time of our choosing.

This airdrop capability, as projected from the United States over strategic distances (a classified distance that is outlined in the Defense Planning Guidance), is called “Strategic Brigade Airdrop.”

The airborne operation can be launched from a considerable distance away from the target area with such speed as to cause tactical or operational surprise and prevent effective reaction from the enemy. Because of their ability to deploy from the continental United States as well as from within the theater of operations, airborne forces are capable of conducting operations in support of strategic, operational, and tactical objectives. They rapidly deploy over great distances and conduct combat parachute or air-landed assaults to seize and secure vital objectives. (Joint Publication 3-18.1, 1996: I-2)

The need for surprise, the importance of close air support and suppression of enemy air defenses are all at the core of the doctrine; the fundamentals concepts governing the employment of Airborne forces was relatively unchanged since WWII. As a power projection platform, the C-17 was supposed to make the role that Airborne forces could hold in the armed forces of the United States greater than the sum of its parts. With the capabilities that the C-17 promised to deliver, the US Army would be able to develop a requirement for both the initial airdropped force and the follow-on resupply and reinforcement force, which would provide the greatest opportunity for success in airdrop operations. In addition, they emphasized that the overwhelming majority of such

operations would be conducted into areas that provided only small, austere airfields for air land operations. The combination of these two requirements was one of the main drivers in the mix of the future airlift force determined by the Defense Acquisition Board in the fall of 1995.

Airborne forces are, by doctrine, capable of a wide variety of missions, especially when combined with air assault forces. In all cases, they must either be resupplied or extracted in a timely manner to adequately ensure mission success. The importance of air superiority and suppression of enemy air and ground forces in the area of operations cannot be overemphasized. The doctrine that the Army was able to develop also emphasized the deterrent nature of this airborne force. As an illustration, it points to the crisis in Haiti in 1994: “During Operation UPHOLD DEMOCRACY in Haiti, 1994, the imminent arrival of the 82<sup>nd</sup> Airborne Division convinced the Haitian dictators to relinquish power” (Draft Pub. 3-18.1, 1996: II-2).

When procurement of the C-17 versus the NDAA was decided, the stage was then set for advancements in the employment of mobility aircraft. Soon, the C-17 would be given the opportunity to prove its ability to perform the mission. We have examined the history of the airborne concept, and the continued expansion of the role and range of airborne forces. To fully appreciate the decision to purchase the C-17 versus other platforms, it is appropriate to compare the limitations of the individual airframes. The strengths, weaknesses and overall merits of the individual airframes in the USAF illuminate the importance and appropriateness of their being appropriately used in support of airborne operations.

The C-130 Hercules primarily performs the tactical portion of the airlift mission. The aircraft is capable of operating on rough dirt strips (SAFs) and is the prime transport for air-dropping troops and equipment into hostile areas. Four decades have elapsed since the Air Force issued the original design specification, yet the aircraft remains in production. Since its original inception, the aircraft has gone through many variants, with the C-130J model entering the Air Force in February of 1999. The C-130J has brought substantial performance improvements over all previous models. Accordingly, since the Air Force still has a substantial number of other variants currently being used, the data for both the C-130E and C-130J will be used in forthcoming comparison charts. It is important to note that although the C-130H has a range of 1,300 nautical miles, and the C-130J has a range of 1,600 nautical miles (assuming a payload of 35,000 pounds in each case) neither one currently has the capability to conduct aerial refueling. Furthermore, the maximum payload for the C-130E/H/J models is either 6 pallets or 64 paratroopers.

There is, however, a C-130 variant, the MC-130H Combat Talon II, that has been developed in order to directly support Airborne (and specifically special operations forces, or SOF) operations. The development of the Talon II program began to fully develop only in the late 1980s, with the first actual flight-testing of the MC-130H beginning in September of 1988. The MC-130H arrived at Hurlburt Field in 1991, and was assigned to the 8<sup>th</sup> SOS (Special Operations Squadron.) The mission of the MC-130H is to conduct infiltrations into politically denied and/or sensitive and defended areas in order to resupply or exfiltrate special operations forces and equipment. These missions are conducted in adverse weather at low level and long range. The aircraft is supported with organic depots for the aircraft, radar, radome, as well as its mission computer. The

MC-130H has two types of radars, both the AWADS (Adverse Weather Aerial Delivery System) and the AN/APQ-170 systems, which provide a redundant dual-band forward-looking radar. These are integrated to provide both terrain-following and terrain avoidance features, as well as ground-mapping, weather detection and avoidance, and beacon interrogation methods of operation. These special navigation and delivery systems are particularly relevant as they are used to locate small drop zones and deliver paratroopers and/or equipment with greater accuracy and at higher speeds than is possible with a standard C-130. Not only is the aircraft able to penetrate hostile air space at low altitudes, but also the aircrews are specially trained in night and adverse weather operations.

The MC-130H is limited, however, by the number of paratroopers and/or cargo that it can carry. In addition to improved engines that provide an increased ceiling for operations, maximum takeoff load similar to the other aircraft of the C-130 series, and the ability to conduct aerial refueling operations, the Combat Talon is a significant improvement over other C-130 models. However, the MC-130H remains only an improvement, in that it still only has the capability to carry 52 paratroopers, or 75 troops.

The C-17 Globemaster would prove to be the most flexible cargo aircraft entering the airlift forces. The C-17 is capable of rapid strategic delivery of troops and all types of cargo to main operating bases or to forward bases in the deployment area. The aircraft is also capable of performing tactical airlift and airdrop missions when required. The inherent flexibility and performance of the C-17 force would effectively improve the total ability of the MAC airlift system to fulfill the worldwide airlift requirements of the United States.

The ultimate measure of airlift effectiveness is the ability to rapidly project and sustain an effective combat force close to a potential battle area ([www.af.mil/factsheets](http://www.af.mil/factsheets), 2004) then the C-17 would indeed prove itself to be a highly effective aircraft. Two outstanding features that the C-17 has brought to the USAF are reliability and maintainability. The Boeing warranty on the aircraft assured a mission completion success probability rate of 92%, 20 maintenance man-hours per flying aircraft and full and partial mission availability rates of 74.7 and 82.5 percent, respectively.

With a maximum peacetime takeoff weight of 585,000 pounds (or 265,352 kg), an effectively global range with its ability to refuel in flight, the ability to carry 102 troops/paratroopers or 18 pallets of cargo, and the ability to land at SAFs, the C-17 should indeed prove to be an exceptional asset in the USAF arsenal. In many respects, the C-17 out-performs the C-130, C-141 and C-5 models, but remains a complementary asset in the US military arsenal.

## **Chapter 2.8**

### **First Steps: BRIGHT STAR and the late 1990s**

Having more clearly examined the technical limitations of the individual airframes within the Air Force inventory, we can now more effectively examine the tactics, techniques and procedures that have been used in the employment of the C-17. Specifically, we will look at the 75<sup>th</sup> Ranger Regiment's use of the platform during Operation BRIGHT STAR in 1995, at the 82<sup>nd</sup> Airborne's long-range operations in CENTRASBAT '97, airborne operations in Operation ENDURING FREEDOM and the 173D Airborne Brigade's HLTi drop into Northern Iraq during Operation IRAQI FREEDOM.

Initial airdrop testing was conducted with the C-17 at the Yuma proving grounds in April of 1994. Of the concerns that were raised, the most notable was the resolution of preventing parachutists exiting the aircraft from "crossing over." This occurred when "[paratroopers exited] simultaneously from opposite sides of the C-17 in a rapidly paced, static line jump." At the time of the test officials stated that although the static lines of the two parachutists involved in the test contacted, the test subjects "were able to safely land without further incident." (Hughes, 1995: 23) Clearly, however, changes would be needed prior to full implementation of the C-17 as a platform for the tactical insertion of airborne qualified personnel.

After the initial tests of 1994, the Army and the Air Force collaborated on tests looking at the potential benefits of altering aircraft speeds, pitch angles and flap settings, as well as modifying the air deflectors on the sides of the aircraft fuselage. It was ascertained that to mitigate the probability of jumpers coming too close together (and/or

making violent contact with each other as their static lines drew them together underneath the body of the aircraft) changes should be made to “maintain a minimum separation of 15ft. between paratroopers during rapid-paced jumps.” (Hughes, 1995: 24)

Based upon the tests conducted, it was determined that in order to have optimal employment and minimize the risk of paratroopers being injured in the process of exiting the aircraft, the following measures would be taken:

- Jump door air deflectors would be set at an angle of 40% vs. 60% to the fuselage in order to minimize the turbulence behind the aircraft.
- Static line length would be increased to 20 feet instead of 15 feet, which would result in a lessened probability of parachutists making contact with each other underneath the aircraft
- Paratroopers would receive training in aircraft exit procedures which dictated a 90% movement relative to the side of the fuselage
- Airspeed for the drop would be 130 knots (which is the same as that of the C-130) (AFI 11-231, July 1998)
- Aircraft gross weight for paratrooper drops was limited initially to 360,000 pounds, in order to minimize the turbulence behind the aircraft. This was a reduction of 20,000 pounds from the previous maximum gross weight, and far short of the C-17’s maximum gross weight of 585,000 pounds. (Fulghum,1995:17.)

The results of the testing conducted concluded that within the parameters of employment prescribed above, the C-17 was an able platform for paratroopers. The issue of turbulence behind the aircraft would ultimately prove to be a significant factor in the

continued utilization of the C-17. It would prove particularly relevant when choosing whether to use the C-17 versus a variant of the C-130.

It should be noted that the testing of the C-17 as an airdrop platform did not reduce the amount by which the airframe was used for other purposes. The aircraft was used extensively in humanitarian operations “[...] in Rwanda and [could be used for] what we may have to do [relief operations] in Burundi. There is a human crisis of disaster proportions, and [there is where we will] want to move relief aid... to an unimproved airfield from the U.S.” (Fulghum, 1995: 22).

The C-17’s ability to penetrate into SAFs would also be used extensively in support of the air land operations in Bosnia. (Anon. Article, *AWST*, 1996: 31) “During the Task Force Hawk operation in 1996, while supporting ground troops in Bosnia, the C-17 saw for the first time actual operations into a SAAF [sp.] directly supporting the field commander. [...] C-17s were deployed to Germany and flew around the clock missions, delivering vital equipment to the deployed army unit in Tirana, Albania. The performance of the Air Force C-17 was one of the great success stories of Operation ALLIED FORCE. The planes flew half of the strategic airlift missions required during the operation. In the end, over 500 sorties were flown, moving over 22,000 tons of equipment and personnel.” (Shanahan, 2002: 8)

Soon thereafter, the USAF and the Army had to demonstrate the potential of the C-17 as a platform for airborne insertion. This took place during Exercise BRIGHT STAR 1995, a joint exercise between the Egyptian and the U.S. forces. Two Air Force C-17s completed the first-ever strategic airdrop from the airframe, flying 147 Army Rangers nonstop from Ft. Benning, GA., to Egypt for a mass parachute drop. The aircraft



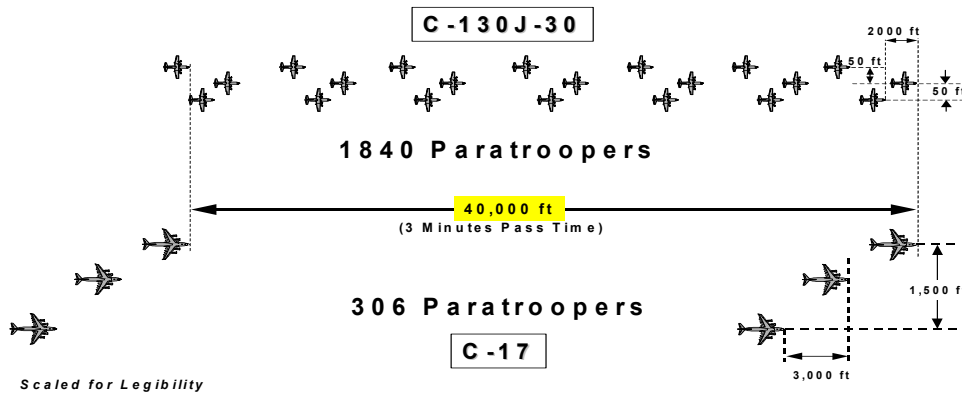
took off from the Lawson Army Airfield in Georgia to a drop zone near Cairo. The duration of the flight was over 14.5 hours, covered over 6,400 nautical miles, and included an enroute aerial refueling using a KC-10. During this mission, the C-17s descended to low level to drop members of the 3<sup>rd</sup> Battalion, 75<sup>th</sup> Ranger Regiment from approximately 800 feet AGL (above ground level).

COL Jack Pledger, the deputy director of plans at Air Mobility Command, was quoted at the time as saying that “this small exercise shows how a larger number of C-17s could air drop an Army brigade-size unit.”(Hughes, 1996: 63) He also noted that earlier in 1995, six C-17s had demonstrated the ability to airdrop brigade-sized units earlier that summer, with the first four C-17s in the formation dropping equipment, with the remaining two carrying paratroopers.

The issue of wake vortices remained relevant for larger formations and airdrops, however. As a result of further testing conducted in 1996, it was determined that a distance of less than 27,000 feet between C-17s would create wingtip vortices that both paratroopers and aircraft in trailing formation would be forced to deal with. The tests conducted revealed that too close of a following distance would result in canopy deformations, excessive parachute oscillations, as well as increased rates of descent for the paratroopers who exited C-17s. Subsequent testing revealed the minimal following distance to be 40,000-foot spacing, including a minimum lateral interval of 3,000 feet between individual aircraft. (Moffat, 1998: 12)

The issues with vortices stemmed from the fact that an aircraft weighing 360,000 pounds, moving at a rate of 130 KIAS (knots indicated air speed) over a DZ (drop zone) creates large and significant wingtip air currents; by comparison, the standard visual in-

trail formation for C-130 aircraft is 2,000 feet. In the amount of airspace required by two series of 3-ship formations of C-17s, a significantly greater number of C-130s can move through. In effect, the C-130 can put a greater number of paratroopers on the ground in a shorter amount of time.

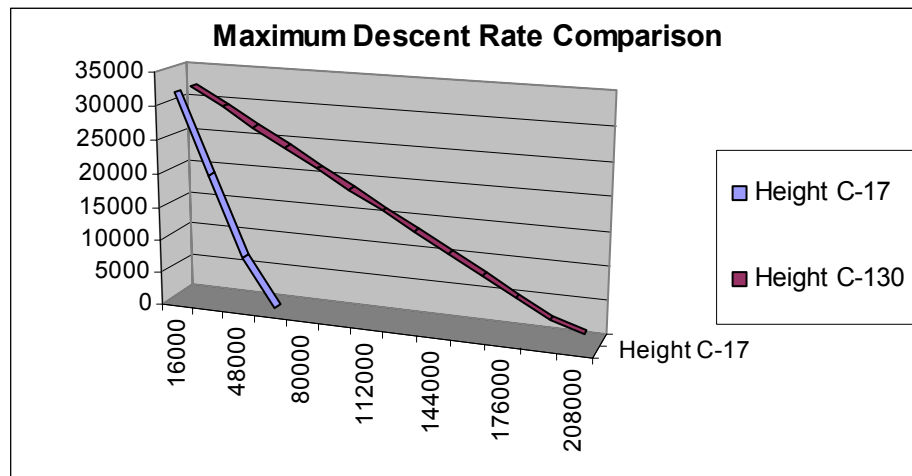


(Figure 2, Visual Meteorological Conditions Personnel airdrop (Moffat, 98))

Whereas the C-130 can put more paratroopers on the ground in a shorter amount of time, the C-17's ability to drop more heavy equipment (HE) platforms and container delivery system (CDS) bundles. The C-17 can airdrop a 60,000-pound equipment platform or can airdrop sequential platforms weighing up to 110,000 pounds, even though currently the US Army's largest strategic brigade airdrop (SBA) platform weighs 42,000 pounds. By comparison, the C-130 can only drop up to 42,000 pounds of HE (Heavy Equipment.)

Providing further measures of comparison between the C-17 and the C-130, we can measure the maximum effective descent rate for the aircraft. A C-130 type of aircraft with a full load has a maximum descent rate of approximately 2,700 fpm, (AFI 231-11, 1998). This is based upon calculations derived using the AFI, using the variables of 100

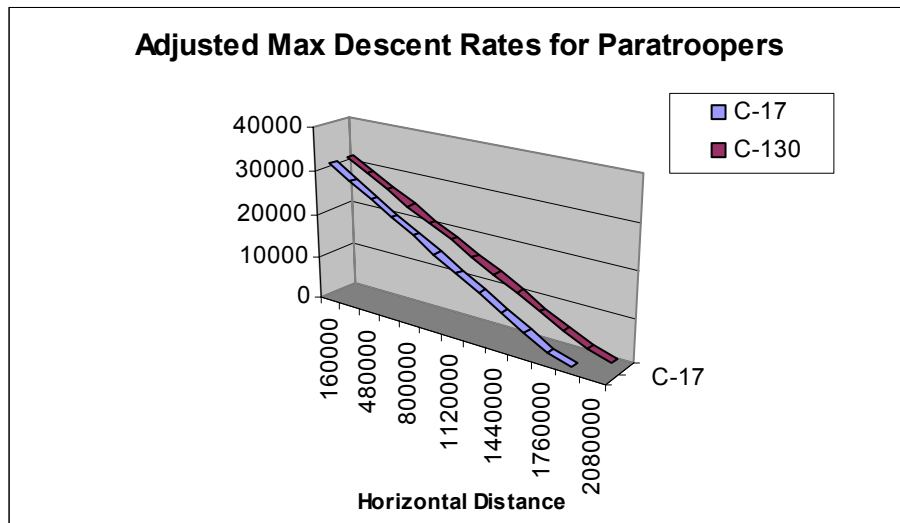
degrees Fahrenheit, sea level, with the aircraft's maximum gross weight being 155,000 (the established weight for the aircraft for assault landings.)



(Figure 3: Derived Maximum Descent Comparison)

Under the same conditions, the C-17 has the ability to conduct tactical descents up to 12,000 fpm, carrying a load of 505,000 pounds. This is also based upon calculations derived using the AFI. Again, the variables in this comparison are constant; with an ambient temperature of 100 degrees Fahrenheit, at sea level. Subsequent test jumps revealed that the rate of descent preferred by the US Army for paratroopers was a maximum of 3,000 FPM (feet per minute.) This was due to the fact that paratroopers and unsecured items on the inside of the airframe had a tendency to float and/or become unstable at descent rates in excess of 3,000 FPM.

In addition to this, it was determined that the paratroopers in the aircraft require a minimum amount of time in order to perform final checks prior to exit. This includes not only equipment checks, but the Jumpmaster (Senior Parachutist) must complete a series of checks of the exterior of the aircraft to ensure that it is still a suitable platform for executing a jump.



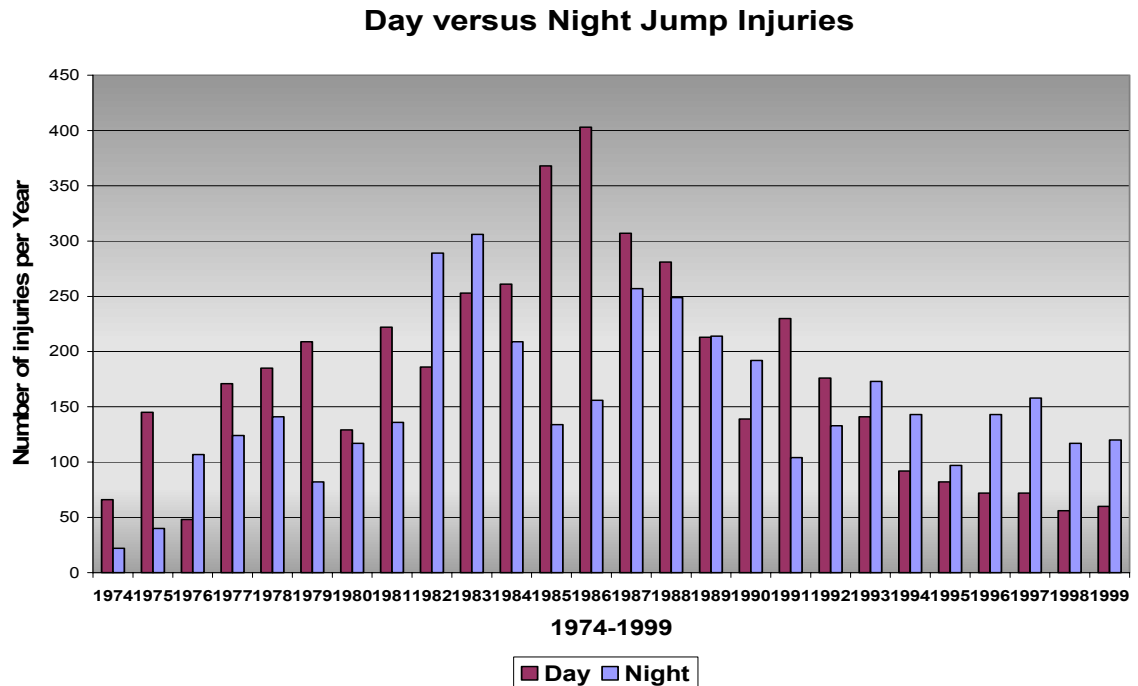
(Figure 4: Adjusted Derived Maximum Descent Comparison)

Each individual paratrooper then completes a personal equipment check, and a subsequent inspection of the equipment of the personnel ahead of them in the “stick,” or series of paratroopers. Although the C-17 could clearly descend more rapidly than a C-130 model, this capability has not been fully exploited. Procedural requirements put into place to allow paratroopers to prepare were the primary limiting factor.

Airlift in Operations ENDURING FREEDOM and IRAQI FREEDOM included both C-17 and C-130s. The seizure of Kandahar IAP in Afghanistan was accomplished using C-130-type aircraft. The seizure of the Bashur airfield in Northern Iraq was accomplished using C-17s. In the separate cases, decisions were made regarding which aircraft to employ based upon the separate strengths and weaknesses of the individual airframes, balanced against the tactical situation.

If one were to posit that more injuries are sustained jumping out of the C-17 than from the C-130 family of aircraft, it would be a reasonable assumption that there would be an increase in the overall number of injuries and/or deaths of paratroopers. However,

this is not the case, and injuries (according to the US Army Safety Center) have actually seen a steady decline since peaking in 1986. This is evident when one looks at figure 5, a comparison of day vs. night jump injury rates.



(Figure 5, Day vs. Night Jump injury rates, US Army Safety Center, 2004)

Data for the most recent Airborne operations has not been made public at this time, but based upon the relatively steady rate of operations and policies up until 1999, it can be assessed that the injury rates of the last 48-60 months are not dramatically different. Apparently, when properly employed, both aircraft have similar means of employment and similar injury rates. Therefore, another means of determining which airframe is better suited to the delivery of paratroopers is through subjective analysis and exploratory research.

## **Chapter Three**

### **Methodology**

The design of this research project is to perform exploratory analysis, hinging specifically on interviews conducted with members of the US Air Force community who have inserted paratroopers, and members of the community of US Army military parachutists who have exited the aircraft in question. The subjects were specifically told that their names would not be used in conjunction with the interview process, in order to ensure they would express their opinions regarding the separate airframes freely. The means of comparison chosen for the C-17 and the C-130 as airframes for the insertion of airborne troops are qualitative, focusing on interviews conducted with both pilots and paratroopers. The pilots chosen were representative of their respective airframes and had extensive knowledge of the capabilities and weaknesses of their individual airframes, in both training and combat environments. The paratroopers interviewed through the course of this research were selected based upon their level of experience with exiting both types of aircraft in both training and combat environments.

The primary intent of this research was to determine if the C-17 is the superior (subjectively preferred) aircraft in the military parachutist and paratroop inserting communities. A secondary, but no less relevant purpose of the research interviews, was to assess whether the opinions of the USAF and US Army communities are in line with each other. As a tertiary goal in conducting this research, it was also intended to determine what direction the individual communities felt that airborne insertions were

headed, and what combinations of aircraft would be used to accomplish the mission in the future.

The total number of pilots interviewed for this research was 14, with 6 C-130 interviewees and 8 C-17 pilot interviewees. The ranks of the pilots interviewed were in the O-3 to O-5 range, with the majority (80%) being O-4s. The C-130 pilots interviewed could be subjectively placed in the top 10% of their community of aircraft. Their credentials included distinguished graduate of the C-130 Weapons Instructor Course, and being selected to serve as evaluator pilots. There were graduates of the US Air Force Academy, as well as private institutions, such as the Virginia Military Institute. Their knowledge of the C-130 and its variants is derived from training and experiences during operations in Bosnia, Operation ENDURING FREEDOM, and IRAQI FREEDOM.

The C-17 pilots interviewed for the purposes of this GRP could also be regarded as in the top 10% of their field. The pilots were also graduates of the USAF Advanced Airlift Tactics Training Course, as well as Intermediate Developmental Education (IDE). The academic background of the group of pilots interviewed included both graduates of the US Air Force Academy, as well as public institutions. Their knowledge of the C-17 was likewise derived from training and experiences during operations in support of operations in the Balkans, as well as in support of Operations ENDURING FREEDOM and IRAQI FREEDOM, participating in both planning for and the execution of the 173<sup>rd</sup> Airborne Brigade's insertion into Northern Iraq. The group of interviewees also included a former member of the SOLL-II (Special Operations Low-Level) community. Two of the interviewees were originally assigned to the C-130, and subsequently cross-trained on the C-17.

In order to ensure that the nature of the research used multiple methods that were both interactive and humanistic, the questionnaire used for the interviews of the pilots first asked the following general questions:

- Name
- Rank
- Total number of paratrooper insertions
- Total number of combat paratrooper insertions
- Locations (if UNCLAS) of combat drops
- Length of time that the pilots had been flying the particular aircraft
- Extent of military education

Subsequently, in order to gain a more complete understanding of their opinions, the following, more subjective questions were asked:

- Have you conducted a HLT I (High-Low Tactical Ingress)-type drop profile?
- How extensive was the training you received prior to executing the drop(s)?
- Do you have a personal preference in terms of aircraft (if so, which one?)
- Please describe your experiences with dropping paratroopers in your airframe.

Is one airframe superior to the other, and if so, in what way?

- Can you describe your experience with wake vortices with the C-17?  
(Anecdotal information is appropriate and encouraged.)

- Do you believe the C-17 can effectively replace the C-130 (to include the MC-130H and the C-130J) for the tactical insertion of paratroopers?

After the interviewees filled out the questionnaire, follow-up contact was made either face-to-face, by telephone, or, as the least preferred method, via email. This was done in



order to clarify the responses that were given, and to provide a greater depth to the interviews. The pool of respondents for the pilot questionnaire came from pilots stationed at McGuire AFB and Pope AFB.

The total number of paratroopers interviewed for the purposes of this research was 22. The pool of interviewees was selected from active-duty respondents stationed at Fort Benning and Fort Bragg. These paratroopers interviewed included Infantry Officers, Senior Non-Commissioned Officers who either had a MOS (military occupational specialty) that was infantry-related, and junior enlisted soldiers who had served extensively in Parachute Infantry units. The overall military education levels were high, including schools such as IOBC (Infantry Officer Basic Course), IOAC (Infantry Officer Advanced Course), as well as the US Army Ranger, Basic and Advanced Parachutist (“Jumpmaster”), Air Assault, SFAS (Special Forces Assessment and Selection) Course, LRRPS (Long-Range Reconnaissance Patrol School) and SERE (Survival Evasion Resistance and Escape) schools. For the “Jumpmasters”, the average number of jumps in the group interviewed was 63, with the greatest number of jumps accomplished by one interviewee being 85, and the lowest number of jumps being 32.

The various types of aircraft that they had used as jump platforms included but were not limited to the C-17, the C-141, the C-130, the MC-130H and the C-130J, UH-60 helicopters, and balloons. For the purpose of this research project, only the C-130, MC-130H and C-17 platforms were discussed during the interviews. The civilian education level was also comparatively high relative to the population of the United States at large, with an average level of a Baccalaureate Degree among the interviewees.

The questionnaire for the paratroopers started by asking the following general information questions:

- Name
- Rank
- Total number of parachute jumps
- Total number of combat jumps
- Location (UNCLAS) of combat jumps
- What types of Aircraft have you exited?
- What types of aircraft have you exited in combat?

They were then asked to briefly outline their military education (PME). This was followed by the more specific questions:

- Have you participated in an HLTi-type jump?
- How extensive was the training you received prior to the jump(s)?
- Do you have a personal preference in terms of aircraft? (If so, which one?)
- Please describe your experiences with jumping out of the C-17 vs. the C-130.  
Is one airframe superior to the other, and if so, in what way?
- Can you describe your experience with wake vortices with the C-17?
- Do you believe the C-17 can effectively replace the C-130 (to include the MC-130H and the C-130J) for the tactical insertion of paratroopers?

After the interviewees filled out the questionnaire, follow-up contact was made either face-to-face, by telephone, or, as the least preferred method, via email. This was done in order to clarify the responses that were given, and to provide a greater depth to the interviews.

As was previously stated, the strategy for the conduct of the research hinged on information that was gained through interviews, complemented and/or supplemented by follow-up questioning when clarification was needed or when it was felt that a certain subject was more willing and/or able to provide information. Many of the questions asked through this research were open ended. This was done to facilitate the interviewees' expression of their own views.

## **Chapter Four**

### **Results – The Paratrooper Perspective**

From the perspective of the paratrooper community, there is a consistent preference for the C-17 during training missions. However, in the responses regarding which aircraft they would prefer to use when being inserted into a combat environment, there was an equally universal preference for the use of the C-130 airframe, and the variant most frequently referred to in this preference was the MC-130H.

The primary distinction that the users (paratroopers) made between the airframes was that the C-17 is clearly seen as a more strategic airlifter by the community of paratroopers, whereas the C-130 is viewed as a more tactical, and more survivable aircraft. It is possible to attribute at least a portion of this bias within the airborne community to the fact that the C-130s (and specifically the MC-130H Combat Talons I and II) are ‘combat proven’ aircraft. The majority of the interviewees referenced historical precedents when asked how they had formulated their opinions regarding the superiority of the C-130 as a tactical airframe. In fact, one of the interviewees went so far as to reference the employment of the C-130 at Khe San, stating that the refined TTPs and the proven track record bolstered his confidence when conducting a tactical insertion.

When asked how the insertion of the 173<sup>rd</sup> into Northern Iraq at Bashur affected their opinion of the aircraft, the overwhelming majority of the interviewees were not convinced that the airframe had proven itself as a platform for the insertion of paratroopers. The consensus from the Airborne perspective was that the airfields seizure “looked cool, but there are guys out there that are doing things that are much harder.”

From the perspective of the paratroopers, the DZ (drop zone) that was used for the insertion was, from their (albeit limited) point of view, secure. It must be reiterated that the interviewees were emphatic in not ‘taking anything away from’ the 173<sup>rd</sup> ABN BDE’s successful operations, but it was ‘not as dangerous as Western Iraq was at the same time’ since the threat on the DZ was in fact much lower than had been estimated.

This points out a fundamental disconnect between the paratroopers and the pilots who insert them into drop zones; repeatedly, the different interpretation of how ‘inherent risk’ is defined was revealed. It can be posited that the US Army Airborne Community and the USAF Community of pilots who insert those paratroopers have differing opinions regarding how ‘acceptable risk’ and ‘acceptable losses’ are defined.

The overall impressions of the C-17 were that although it is an inimitable strategic asset, to be used for long (strategic) moves (i.e. from Pope AFB to Mongolia, or Pope AFB to Egypt) there are factors that limit its effectiveness in deploying paratroopers at long ranges. Specifically, there was great concern that (due to the required 3,000-foot spacing between C-17s) it would take longer (from their estimation, almost twice as long) to get the same number of troops onto smaller Drop Zones. One paratrooper related an anecdote wherein one of the DZs that was selected for his operation was too thin, and therefore instead of flying wing-to-wing (with a 3,000-foot separation) two C-17s flew one after the other. This resulted in a longer time to get all the troops of the unit on the DZ; one trooper asserted that it took 40% longer, on average, to get all his soldiers onto a DZ when exiting the C-17.

It was stated that the Commander who is planning the mission must balance the risk of vortices and timing, and not ‘max out’ the airspace by sending in too many aircraft

through the same space in a compressed amount of time. Additionally, the troopers presented a concern that making two passes would present a greater target to the enemy. Additionally, it was felt that making sequential passes over a DZ more than doubles the threat to soldiers and aircraft alike, as any enemy forces on the ground could be alerted and muster to the DZ while the first ‘pass’ of paratroopers was just being established. In addition, it was felt that by using multiple passes, enemy forces in the area would be alerted to an attack. The enemy, using this ‘warning,’ could then react with a QRF (Quick Response Force) and reappportion and deploy any SAM (surface to air missile) assets that they may have had at other locations. It was also stated that there were concerns that the noise of the jet-powered C-17 would likely alert enemy forces more easily than a larger number of turboprop-equipped C-130 aircraft.

When questioned regarding vortices experienced when jumping out of the C-17, there was again a consensus that no ‘out of the ordinary’ exit complications (canopy deformations, excessive parachute oscillations, as well as increased rates of descent) had been experienced, but this was attributed to proper planning and implementation of adequate following distances (which also reinforced earlier statements that it took longer to get troops onto a small DZ using the C-17 instead of the C-130.)

The perceived tactical superiority of the C-130 seems to stem from its ability to get more “chutes in the air” in the same timeframe as a C-17. Going back to the historical precedents of the development of Airborne forces, the need to get the maximum fighting force on the ground in the shortest amount of time supports this rationale.

Overall, the impression of the C-17 as a platform for the insertion of Airborne troops is that it is ‘not the platform of choice – depending on the situation.’ While it was

acknowledged repeatedly that it has capabilities that the C-130 and its variants do not possess, it is still viewed as an airframe that should remain more strategic in its use, versus employing it in a tactical situation. It was emphasized that the Globemaster III is “a great aircraft... a great new aircraft.” However, this newness appears to lend itself to reinforcement of old preferences.

When asked if the C-17 should and would replace the C-130 as an aircraft for the insertion of Airborne troops, the response was mixed. Some of the interviewees were adamant (and enthusiastically so) about the C-130 being irreplaceable, saying that “the C-17 cannot, and never will replace the ‘Herc’. The C-17 is sexy, but it [its replacement of the C-130] just isn’t going to happen.” The replacement the C-130 with the C-17 was compared to “putting a bus in the Indy 500. Yes, they are both vehicles, but it is simply something that you would not want to do.”

Other respondents were more open to the possibility of change. The C-17, it was believed, could reasonably replace the C-130 with some changes. Specifically mentioned were abilities to penetrate radar, since ‘serious’ IADS (Integrated Air Defense Systems) are perceived as presenting too great of a threat to the C-17. When the C-17 has IADS-penetrating capabilities that are comparable to that of the Combat Talon II, then the paratroopers will be much more comfortable with the idea of jumping from them into a higher threat environment.

Replacing the C-130 and its variants with the C-17 is perceived as a poor idea. Although one of the interviewees, a Senior NCO who had spent over 10 years with the 75<sup>th</sup> Ranger Regiment, specifically stated that he was “very pleasantly surprised with the C-17,” there is still a significant amount of resistance to using the C-17 for tactical

missions that have higher threat levels. The C-130 and its variants are perceived as being cheaper overall than the C-17, and it was felt that more C-130-series aircraft would be better than the lesser number of C-17s that could be bought for the same price; “C-130s give us [Airborne Forces] more ‘bang for the buck.’”

The overall consensus was that both types of aircraft are essential for the future of the Airborne force. Missions should integrate both aircraft based upon their individual strengths and weaknesses (ability to penetrate higher risk areas for the C-130, ability to move and drop heavy loads with the C-17.) This was reflected most clearly by the statement by an Army CPT, who stated, “airfield seizure requires both to be available. [Ideal operations] would punch in with Talons, then pile on using C-17s.” The use of the C-17 in the initial wave of an Airborne assault was perceived as being an unnecessary risk.

The consensus, then, among the paratroopers interviewed, was that the C-17, while a capable aircraft, should not replace the C-130 as a platform for the insertion of Airborne troops. Both aircraft are perceived as being exceptional in their own rights, but the C-130 is seen as a preferable platform for tactical insertion of paratroopers.

### **Results – The Pilot Perspective**

The C-130 interviewees did not believe that the replacement of their aircraft by the C-17 would be appropriate either currently or in the near (5 years) future. Fully acknowledging that every aircraft has capabilities and limitations specific to itself, they still stated that the abilities of the C-130 enable it to accomplish something that makes it indispensable for current Airborne operations; the ability to get a larger number of



paratroopers on the ground in fewer passes. The C-130's comparatively limited range was more than offset in their opinion by its ability to 'mass' paratroopers on a relatively small site. Additionally, it was felt that the ability of the C-130 airframe to carry fewer troops and/or equipment was in fact an asset, and not a liability. This rationale was explained by saying that 'you're not putting all your eggs in one basket.' In effect, whereas it is possible to put 101 paratroopers in a C-17, it will be more damaging in terms of loss of life and even aircraft cost than if a C-130 or MC-130H were to be brought down by enemy fire.

When asked about whether there had been any issues with vortices and following flight paths after C-17s had been through a portion of airspace, the response was similar to that provided by the paratroopers, that the effect of the vortices was mitigated by spacing the formations and allowing adequate amounts of time between aircraft. It was noted, however, that the spacing requirements for airdrops that included C-17s (mixing C-17s and C-130s and/or their variants) added 'challenging dimensions' to the end goal of achieving the user's (the Airborne Commander's) objectives. The top 'challenging dimension' was that of being able to mass troops on a drop zone in a timely manner.

When asked specifically about what their perceptions of the future of the C-130 were, the pilots responded that based upon the current crew training levels and the current numbers of aircraft and personnel in both the C-17 and C-130 communities, the Globemaster would not replace the 'Herc' as the platform of choice. It should be noted, however, that the perception of the relationship between the two communities is not perceived as adversarial, but rather complementary. When asked further about this, the

interviewees tended to respond that the C-17 is a welcome addition to the tactical airlift community, due to the fact that ‘it provides great capabilities.’

The perspective of the C-17 pilots interviewed was similar in many respects to that given by the pilots from the C-130 community. The overall consensus on the opinions was summarized by the opinion that “sometimes the C-17 is the best choice. Sometimes the C-130 is the best choice. The mission, enemy, time available, terrain and equipment available will dictate which airframe gets the nod.”

Personal preference in terms of airframes tended to be towards the airframe that they flew. However, this was not to the exclusion of other airframes within the USAF inventory (i.e., the C-130 and the MC-130J.) The key distinction brought up between the two was a perception that the C-17 is more appropriate for the insertion of a Battalion-size element vs. for a Strategic Brigade size. Of particular concern to several interviewees is a perception that ‘force tailoring is broken.’

This assessment seems to stem from the development of the Army’s new ‘smaller and lighter’ force. One of the respondents stated that in order to fully answer a question that concerned the superiority of one airframe versus another, it would have to be examined in the context of the US Army’s new ‘objective force’ concept. The rationale that was given for this was his opinion that the US Army has yet to clarify what the requirements of the future will be (i.e., what will the logistical requirements for the Stryker Brigade entail) relative to airlift requirements.

When asked about HLTII-type profiles, the majority of respondents stated that they had in fact executed the maneuver. In fact, one of the respondents was part of a SOLL-II operation in Operation IRAQI FREEDOM and had actually used the same

technique for the insertion of SOF forces into Western Iraq. One respondent in particular stated that the HLTi technique was best used in scenarios that allowed for use of the maximum descent rate of the C-17; dropping palletized cargo and/or airland operations favored this. This is due to the fact that paratroopers require time to rig up prior to exiting the aircraft; palletized cargo does not.

When asked about whether HLTi was "... the wave of the future," the response was generally ambivalent; HLTi was a technique to be viewed as a part of a pilot's 'kit bag' instead of a panacea for the avoidance and negation of SAM threats and the like. One of the respondents stated, "[...] there is no way that we can ever completely, 100% avoid threats. We minimize our exposure to that threat, because we have to get into that envelope to deploy. Our objective should be to minimize the risk, because the risk will always be there." Another respondent was more succinct, saying that it was "statistically impossible" to completely avoid a threat.

A portion of the interviewees sought to expand on this. Although the approach technique was appropriate for use in the insertion of the 173<sup>rd</sup> ABN into Northern Iraq, it was felt that it will not necessarily be the best approach for future Airborne insertions – and the C-17 will not necessarily be the best platform for those future insertions. Of particular interest was the response by one of the interviewees regarding the use of the C-17 and the use of its rapid descent capabilities. "Some of the lessons that we learned from Operation ENDURING FREEDOM [were] applied the wrong way in Operation IRAQI FREEDOM." When asked to further clarify the statement, the interviewee stated, "...historically, we have trained without threat mitigating elements [A-10, AC-130 and

fighter CAP support]... we need to have a more combined total force. We cannot afford to be lone [unsupported and/or under-supported] operators.”

When asked about whether they had experienced any issues with wake vortices, the response was best summarized in three words by one respondent; “Moose wash su\*ks.” “Moose wash” is the effect of turbulence generated by a C-17 flying through airspace; what the interviewee was stating (and later clarified) was that the turbulence generated by the C-17 is excessive, and therefore following distances must be properly maintained in order to ensure that it is avoided. Another respondent stated that, more than the buffeting of the plane and the crew, he was aware of and concerned by the inherent dangers that wake vortices pose to paratroopers. It was by this rationale that “the C-17 is limited due to wake vortices, and it must have SKE (station keeping equipment) in order to remain in proper formations. For this reason, its use in smaller missions is more appropriate.” It was also felt that “it would be hard [technically] to drop troops in moose wash – in combat [forced-entry operations,] it would not be effective.”

When asked about the overall abilities of the Globemaster for the insertion of Airborne personnel, the overall assessment of the C-17 community’s training level was low. “Roughly 20% of our guys tend to stay proficient in airdrop.” This was explained as a function of high OPSTEMPO, combined with the fact that the majority of the missions that the C-17 aircraft are used for are for the movement of cargo, not for the deployment of paratroopers. By contrast, it was stated, “C-130 guys tend to be airdrop qualified – that’s their bread and butter.” It was also stated that there is a lack of training ‘en masse’ by the C-17 community, due to limited training resources and large mission requirements. The solution given most often, in this case, was ‘more training, not

[interviewee emphasis] to fly more cargo'. It was also felt that a great number of planes in the fleet would bring the training level up to a more appropriate level.

When asked whether the C-17 could effectively replace the C-130 and its variants at this time, the majority of the respondents stated that they felt that it could not do so at this time. It was felt that although "[for] smaller packages and longer distances, the C-17 makes sense," there are still too many missions which require the capabilities that the C-130 and the MC-130Hs provide. However, there were a number of respondents who stated, "Eventually, the C-17 will replace the C-130." When asked for further clarification, one of the pilot subjects responded, "the C-141 is a great plane [for the insertion of paratroopers] and we got rid of that, didn't we?"

## **Chapter 5**

### **Conclusions and Recommendations**

The question of whether the C-17 is superior to the C-130 hinges on the type of mission that it is going to be used for; the majority of paratrooper respondents in the course of this research who were emphatic about their preference of one airframe over another were those who had either 1) a small number of airborne insertions (less than 40 “jumps”) or 2) had extensive experience with a certain airframe, which in turn led to their being more comfortable with that airframe (more than 60 “jumps” with a C-130-type aircraft.)

Those paratroopers who were not emphatic in their preference had a tendency to view the subjective superiority of one airframe over another as a clear function of the mission they were going on. Within the shifting preferences, though, this research clearly points out preferences depending upon the missions. For long-range missions, the aircraft that is universally preferred by paratroopers is the C-17. The main reasons that are given for this are environmental; the Globemaster has, compared to the C-130, a much greater amount of room. Therefore, even though one can have a greater number of paratroopers on board at one time, they have a slightly greater amount of ‘flex space’ than in the ‘Herc.’ Additionally, what are perceived as superior (in comparison to the C-130-series airframes) interior noise and temperature controls also led to the C-17 being consistently viewed as ‘the Cadillac of airplanes [for Airborne Forces.]’

For training missions of shorter duration, there was a tendency among respondents (among paratroopers especially) to prefer the C-130 model. However, this

was the ‘softest’ preference noted in the interviewees (roughly 60% preferred the C-130, while 40% preferred the C-17.) This can be attributed to the fact the soldiers interviewed uniformly had fewer jumps from C-17s than from C-130s. ‘Familiarity,’ ‘habit’ and ‘comfort zone’ were reoccurring words during the interviews. Bearing this in mind, it is logical to assume that greater exposure to the C-17 as an insertion platform will eventually reduce or reverse the preference of the C-130 over the C-17 on the basis of the superior ‘creature comforts’ that it (the Globemaster) provides. Both are regarded as adequate insertion platforms.

For short-distance tactical insertions, the C-130 (and especially the MC-130H Combat Talon II) is preferred by paratroopers over the C-17. This is especially true of those soldiers who have served in more tactical and SOF-type units. The basis of this preference by paratroopers is a perceived survivability difference between the Talon II and the Globemaster. Either pilots or paratroopers did not perceive a C-17 with the penetration capabilities of a Combat Talon as a viable alternative to the MC-130H. From the perspective of the pilots interviewed, although there was a tendency towards provincialism, the C-130 was perceived as a more appropriate choice for shorter missions.

Therefore we can sum up the research as such; neither aircraft is perceived as being inherently superior to the other in all situations. Quite to the contrary, the aircraft tend to be perceived as complementary assets to be used when appropriate in “completing the mission.” The appropriateness of employing one type of airframe over another is relevant only within this context. A USAF interviewee who stated, “The C-17 cannot do it all,” best summarized this. “Not even the ‘Talon II’ can do it all. To get the mission

done, we need to balance the use of our assets against our requirements.” It is perceived that to gain one [airframe type] at the expense of another would limit the abilities of both the Army and the Air Force.

Within the group of pilots who were interviewed, in spite of some rhetoric about inherent superiority of ‘my’ airframe to ‘other’ airframes (which can be attributed to an understandable intra-service rivalry) there was an overall consensus that the selection of aircraft for missions was not a clear cut decision at this time. The C-17 was cited as being superior in many facets, but the C-130 airframe was perceived as being equally needed, depending on the mission. Although it was stated that at some point in the future, the C-17 would be able to replace the C-130 completely, it was not felt that this should occur in the near future.

It is recommended that future analysis of this subject be conducted; due to current OPTEMPO (Operational Tempo) requirements and deployments, many potential interviewees were unavailable. Of particular interest would be the 2<sup>nd</sup> Brigade of the 82<sup>nd</sup> Airborne at Fort Bragg, NC, as well as soldiers from the 173<sup>rd</sup> Airborne, currently on deployments in the Middle East. Also, a larger number of respondents is recommended, although there was a significant tendency towards uniformity in the responses received. Additionally, a greater amount of exposure to (and the familiarity they would gain from it) would increase the amount of confidence that paratroopers have in the C-17.

Currently, Airborne Commanders and the Flying units that support them balance the mission requirements against the airlift assets they have available. The consensus among those interviewed was that this should continue until the C-130-series of airplanes



is retired, or the size of the C-17 fleet grows in both its number of ‘tails’ and in its penetration capabilities.

## Chapter 6

### Bibliography

*Airlift Requirements: Commercial Freighters Can Help Meet Requirements at Greatly Reduced Costs.* GAO Report No. NSIAD-94-209, Government Printing Office, Washington D.C., 11 July 1994.

Blair, Clay. *Ridgway's Paratroopers: The American Airborne in WWII.* Garden City, NY: The Dial Press, 1985.

Boston, Ronald, Maj. "Doctrine by Default: The Historical Origins of Tactical Airlift," *Air University Review*, 34:2-3 (May-June 1983.)

Bowers, Robert N., LtCol. "An Analysis of Airlift Enhancements." Unpublished Report No. 5854, Air War College, Maxwell AFB, AL, 1976.

Burrow, Jessie H., Maj. "Airdrop of Personnel and Equipment in a Hostile Environment." Unpublished Report No. 0415-73, Air Command and Staff College, Maxwell AFB, 1973

*C-17 Aircraft: Cost and Performance Issues.* GAO Report No. NSIAD-95-26, Government Printing Office, Washington D.C., 26 January 1995.

"C-17 to Prove Mettle During 30-day Test," *Aviation Week and Space Technology*, No. 14: 77 (3 April 1995).

"C-17 Yuma Drop Tests," *Aviation Week and Space Technology*, No. 14: 77 (3 April 1995).

Department of the Army/DCSOPS. "Strategic Brigade Airdrop." Electronic Message. 261202Z, 26 June 1995.

Department of the Army, Deputy Chief of Staff for Operations and Plans, Director of Requirements (DAMO-FDQ). *Memorandum for C-17 Tactical Utility Analysis Working Group on 82<sup>nd</sup> Airborne Division DRB-Size Airdrop Requirements.* Pentagon, Washington, DC, 3 May 1995.

Department of Defense. *Annual Report Fiscal Year 1982.* Washington, DC: Government Printing Office, 1981.

Department of Defense, *FY 1985 Report of Secretary of Defense Caspar W. Weinberger to the Congress*. Washington, DC: Government Printing Office, 1984.

Draft Joint Publication 3-18.1: *Joint Doctrine for Airborne and Air Assault Operations*. Unpublished Document, Joint Chiefs of Staff, 1996.

Estes, Howell M. Jr., BGen. "Modern Combat Airlift," *Air University Review*, 20: 12-25 (September-October 1969).

Estes, Howell M. Jr., BGen. "The Revolution in Airlift," *Air University Review*. 17: 2-15 (March-April 1966).

Flanagan, Edward M., Jr. *The Angels: A History of the 11<sup>th</sup> Airborne Division, 1943-1946*. Washington, DC: Infantry Journal Press, 1948.

Fruehling, Gudrun R. and Rilverberg, David. "The C-17: From Trouble to Triumph," *Armed Forces Journal International*: 35-39 (September 1995).

Fulghum, David A. "Airlift Studies Examine Need for More C-17s," *Aviation Week & Space Technology*, No. 17: 20-22 (24 April, 1995).

Fulghum, David A. "Defense Studies Back Large C-17, C-33 Mix," *Aviation Week & Space Technology*, No. 12: 26-27 (18 September, 1995).

Fulghum, David A., "Joint Chiefs to Push for C-17, C-33 Mix," *Aviation Week & Space Technology*, No. 14" 63-64 (2 October 1995).

Fulghum, David A. and Smith, Bruce A. "Pentagon Plans 'Aggressive' C-17 Buy," *Aviation Week & Space Technology*, No. 20: 20-21 (13 November, 1995).

Galvin, John. *Air Assault: The Development of Airmobile Warfare*. New York: Hawthorne Books, 1969.

Hickey, Michael. *Out of the Sky: A History of Airborne Warfare*. New York: Charles Scribners' Sons, 1979.

Hitchens, Theresa. "Tests Will Offer Data for More C-17 Buys," *Defense News*: 12 (5-11 June 1995).

HQ Air Mobility Command, Command Analysis, Directorate of Plans (HQ AMC/XPY). *Memorandum for XVIII Airborne Corps on DRB Medium SBA Analysis*. Scott AFB, IL, 1 April 1996.

Hughes, David. "C-17s Fly Long-Range Air-Drop Mission," *Aviation Week & Space Technology*, No. 1: 63 (1 January, 1996).

Jay, Jimmie L., LtCol. *“Evolution of Airlift Doctrine.”* Unpublished Report No. 93. Air War College, Maxwell AFB AL, 1977.

Johnson, Charles L., Maj. *Acquisition of the C-17 Aircraft – An Historical Account.* Unpublished Report No. 86-1270. Air Command and Staff College, Maxwell AFB, AL, 1986.

Joint Publications 3-17: *Joint Tactics, Techniques and Procedures for Theater Airlift Operations.* Washington, D.C.: Joint Chiefs of Staff, 1995.

Klumpp, Richard A., Jr., Maj. *“Strategic Brigade Airdrop: Past. Present. Future?”* AETC, Scott AFB, IL, 1996

McDonald, Dann, LtCol. *“Retiring the C-141 Starlifter – Are We Ready?”* Mobility Times: 14-20 (April 1996).

Miller, Charles, E., LtCol. *Airlift Doctrine.* Maxwell AFB AL: Air University Press, 1988.

Pilsch, Thomas D., LtCol. *“The C-X Requirement,”* Airlift Operations Review., 3: 8-17 (January-March 1981).

Shanahan, Michael R., LtCol, USAF, *“C-17A: Operation Enduring Freedom Employment / Deployment: Lessons Learned.”* Air War College Professional Studies Writing Assignment, 9 December 2002)

Smith, Bruce A. *“C-17 Completes War Surge Test,”* Aviation Week & Space Technology, No.4: 23 (24 July 1995).

Smith, Bruce A., *“C-17 Gains Clearance for Paratrooper Testing,”* Aviation Week & Space Technology, No. 19: 22-23. (8 May 1995)

Thayne, Michael, Maj. *“Parachute/Wake Vortex Interaction During C-17 Formation Personnel Airdrop,”* Staff Summary Sheet, HQ USAF/XORM, Washington, DC, 20 August 1996.

U.S. Army Safety Center, *“Parachute Injury Analysis Workbook,”* Unpublished document, Fort Rucker, AL, 2004.

Ulsamer, Edgar. *“The AMST-C-X Metamorphosis,”* Air Force Magazine: 16-17 (January 1980).

War Department Training Circular No. 113, *Employment of Airborne and Troop Carrier Forces*, 9 October, 1943.

Warren, John. *Airborne Missions in the Mediterranean, 1942-1945*. Maxwell AFB AL: Research Studies Institute, 1955.

Warren, John. “*Troop Carrier Aviation in the USAF, 1945-1955*.” Unpublished USAF Historical Study No. 134, Research Studies Institute, Maxwell AFB AL, 1957.

Weeks, John. *Assault from the Sky: The History of Airborne Warfare*. New York: Sterling Publishing Company, 1978.

## **Chapter 7**

### **About the Author**

CPT Cristian J.T. Simon graduated with a double B.A. (Spanish, and Latin-American Studies) from the University of Virginia in 1995, and was commissioned as a 2LT of Armor in the United States Army. Upon activation for active duty in January of 1996, he attended the Armor Officer Basic Course, Ft. Knox, KY, and was subsequently assigned to the 1<sup>st</sup> Battalion, 34<sup>th</sup> Armor at Ft. Riley Kansas.

After 2 years of branch detail in Armor, he went to the 541<sup>st</sup> Maintenance Battalion, Ft. Riley, Kansas, where he served as the Support Operations Officer for Transportation issues, a Platoon Leader in and Executive Officer of the 24<sup>th</sup> Transportation Company.

In 2000, CPT Simon attended the CLC3 (Combined Logistics Captains Career Course) at Ft. Lee, VA, as well as CAS3 (Combined Arms Staff Services School) at Ft. Leavenworth, KS. Following this, he was assigned to Eight Army HQ, Yongsan, Republic of Korea.

In the 8<sup>th</sup> Army HQ, he was subsequently assigned to the G-4 Transportation, filling the position of JTF NEO (Non-combatant evacuation operations) Logistics Planner. After 14 months, he was then reassigned to the 2<sup>nd</sup> Infantry Division DISCOM (Division Support Command.) After 3 months as the Assistant MCO (Movement Control Officer), he was selected for Company Command of Bravo Company, 702<sup>nd</sup> MSB (Main Support Battalion.) After 15 months with the “Road Warriors,” he was selected by the US Army Transportation Branch to represent the US Army in the ASAM (Advanced Studies of Air Mobility) program, graduating in 2004.

CPT Simon’s awards include the Meritorious Service Medal, the Army Commendation medal, the Army Achievement Medal (2 OLC), the Joint Service Achievement Medal, the Meritorious Outstanding Volunteer Service Medal, the National Defense Service Medal, the Army Service Ribbon, the Overseas Service Ribbon (2), and the Korean Service Medal. He has earned the Basic Airborne Parachutist badge, and the Manchu Buckle (1<sup>st</sup> Battalion, 9<sup>th</sup> Infantry Regiment.)

He has volunteered for and is currently on assignment to Qatar.

CPT Simon’s family includes his parents, Roland and Rosanne, both of Charlottesville, VA. Also included are his sister, brother-in-law and nephew Andree, Eli and Caleb, of Washington, D.C., and his brother, sister-in-law, and nephew, Robin, Amiko and Braden, of Burke, VA.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
1. REPORT DATE (DD-MM-YYYY) 25-06-2004		2. REPORT TYPE Graduate Research Project		3. DATES COVERED (From - To) May 2003 - Jun 2004	
A CASE STUDY OF JUMPING FROM THE C-17 AND THE C-130; A BETTER PLATFORM FOR PARATROOPERS? Case study of pilots and military parachutists preferences and perspectives				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) CRISTIAN J.T. SIMON, CPT, USA				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/ENS) 2950 P Street, Building 640 WPAFB OH 45433-7765				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GMO/ENS/04E-014	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT The unique nature of the relationship between the United States Army and the United States Air Force is never as visible as when Airborne operations take place. The United States has had a fighting force of paratroopers since World War II, and the Air Force has been a key enabler of this fighting force. The key to this synergistic relationship is the proper employment of aircraft, coupled with the right support to the warfighting paratrooper. The C-130 has been supporting Airborne paratrooper forces for over 25 years, and has a proven record of success; Operations URGENT FURY, JUST CAUSE and most recently ENDURING FREEDOM have demonstrated that the airframe has continued to evolve and remains a viable platform for the insertions of paratroopers. Since the C-17 has come into the USAF arsenal, it has made great progress in supporting Airborne operations. The C-17 has executed insertions of paratroopers over large distances. Most recently it was used for the insertion of the soldiers of the 173 <sup>rd</sup> Airborne Brigade into Northern Iraq. Over 1,000 paratroopers were moved from Italy to Northern Iraq, providing both a military lodgement, but also making a very visible show of force to those who would oppose America and her Allies. This research project is to perform exploratory analysis, hinging specifically on interviews conducted with members of the US Air Force community who have inserted paratroopers, and members of the community of US Army military parachutists who have exited the aircraft in question. The purpose of this research is to identify whether one airframe is superior to another for the insertion of Airborne soldiers					
15. SUBJECT TERMS C-130, C-17, Paratrooper, Wake vortices, Airborne operations					
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT  UU	18. NUMBER OF PAGES  78	19a. NAME OF RESPONSIBLE PERSON Major (Dr.) Kirk Patterson
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (include area code) (937) 255-3636 Ext 4528